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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/781,196	02/18/2004	Gerard Francis McLean	1134.15A	1748

21186 7590 11/13/2006

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EXAMINER

CHUO, TONY SHENG HSIANG

ART UNIT PAPER NUMBER

1745

DATE MAILED: 11/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/781,196

Applicant(s)

MCLEAN ET AL.

Examiner

Tony Chuo

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 September 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) 19-28 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18, 29 and 30 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. Claims 1-30 are currently pending. New claims 29 and 30 have been added. Claims 19-28 are withdrawn as being drawn to a non-elected invention. The previous claim objection is withdrawn. The previous 112 rejection is withdrawn. Claims 1-18 and 29-30 do overcome the previously stated 103 rejections. However, upon further consideration, claims 1-18 and 29-30 are rejected under the following new 103 rejections.

Priority

2. Priority to Provisional Application No. 60/479,788 is granted.

Drawings

3. The drawings filed on 2/18/04 are accepted by the examiner.

Specification

4. The disclosure is objected to because of the following informalities: on page 7, line 4 and page 8, line 4, the word "acrylonitirle" is misspelled. Appropriate correction is required.

Claim Objections

5. Claim 3 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper

dependent form, or rewrite the claim(s) in independent form. The chemical structure of vinyl phosphoric acid does not include a COOH group.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1-2, 5-7, and 29-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okaniwa et al (JP 2003-082012) in view of Singleton et al (US 5425865). The Okaniwa reference discloses a cross-linked polyelectrolyte that is produced by polymerizing a monomer in the presence of a proton conductive polymer that has a sulfonic group and a carboxylic acid group for use in a primary battery, secondary battery, or fuel cells (See Abstract and paragraph [0008]). In addition, it also discloses a polymerization solvent that is dimethylacetamide (See paragraph [0077]). Examiner's note: It is well known in the art that a fuel cell comprises a first electrode, a second electrode, and an electrolyte membrane in between the first and second electrodes. However, Okaniwa et al does not expressly teach a first vinyl monomer comprising a COOH group, a cross linking agent comprising a second vinyl monomer, and a photo-initiator. The Singleton reference discloses a polymer membrane comprising: a first polymeric material as a support; a second polymeric material comprising a vinyl monomer that includes carboxylic acid; a crosslinking agent that is

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divinylbenzene, and a photo-initiator (See column 5, lines 19-39 and column 6, lines 51-64). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Okaniwa electrolyte to include a first vinyl monomer comprising a COOH group, a cross linking agent comprising a second vinyl monomer, and a photo-initiator in order to wet the electrolyte more quickly and more thoroughly so that the resistance to ionic migration through the membrane becomes stable quickly and at an advantageously low value. Examiner's note: It is noted that claims 29-30 are construed as product-by-process claims and that the product itself does not depend on the process of making it. Accordingly, in a product-by-process claim, the patentability of a product does not depend on its method of production. Therefore, it has been held similar products claimed in product-by-process limitations are obvious (*In re Fessman* 180 USPQ 324 (CCPA 1974)).

8. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Okaniwa et al (JP 2003-082012) in view of Singleton et al (US 5425865) as applied to claim 1 above, and further in view of Fleischer et al (US 5741611). However, Okaniwa et al as modified by Singleton et al does not expressly teach a first vinyl monomer that is a vinyl phosphoric acid. The Fleischer reference discloses a first vinyl monomer that is a vinyl phosphoric acid that is polymerized to form a proton conductor membrane (See column 7, lines 27-30). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Okaniwa/Singleton electrolyte to include a first vinyl monomer that is vinyl phosphoric acid in order to form a proton

conductor membrane that swells in contact with water and improves the electrical contact between the electrodes.

9. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Okaniwa et al (JP 2003-082012) in view of Singleton et al (US 5425865) as applied to claim 1 above, and further in view of Linder et al (US 5599506). However, Okaniwa et al as modified by Singleton et al does not expressly teach a cross linking agent comprising di-vinyl sulphone. The Linder reference discloses a gel membrane where di-vinyl sulphone is used as the cross linking agent in the polymerization (See column 7, lines 20-27). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Okaniwa/Singleton electrolyte to include a cross linking agent that is di-vinyl sulphone in order to form a mechanically strong gel membrane with the proper porosity for ionic conductivity.

10. Claims 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okaniwa et al (JP 2003-082012) in view of Singleton et al (US 5425865) as applied to claim 1 above, and further in view of Nam et al (US 2003/0219640). However, Okaniwa et al as modified by Singleton et al does not expressly teach a curable liquid electrolyte comprising a protonic polymer that is sulphonated polyether ether ketone and an elasticizing agent that is acrylonitrile. The Nam reference discloses a proton conducting polymer membrane comprising a protonic polymer that is sulphonated polyether ether ketone and an elasticizing agent that is acrylonitrile (See paragraphs [0019],[0020]). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Okaniwa/Singleton electrolyte to include a protonic

polymer that is sulphonated polyether ether ketone and an elasticizing agent that is acrylonitrile in order to improve membrane conductivity, flexibility, water remaining ability, dimensional stability, and adhesion bonding ability.

11. Claims 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okaniwa et al (JP 2003-082012) in view of Singleton et al (US 5425865) as applied to claim 1 above, and further in view of Puffer et al (US 3403054).

However, Okaniwa et al as modified by Singleton et al does not expressly teach first and second spacers connected to the first and second electrodes wherein the curable liquid electrolyte is disposed between the first and second spacers and an injection port disposed between the first and second electrode forming a cavity wherein the curable liquid electrolyte is disposed in the cavity; a porous substrate; at least one channel disposed in the porous substrate having a first channel wall and a second channel wall wherein the first electrode is disposed in the first channel wall and the second electrode is disposed in the second channel wall, and the curable liquid electrolyte is disposed in the channel.

The Puffer reference discloses first and second spacers "16a" & "16b" connected to the first and second electrodes "19" wherein the electrolyte is disposed between the first and second spacers and an injection port "18" disposed between the first and second electrode forming a cavity wherein the electrolyte is disposed in the cavity "17" (See Figure 1). Examiner's note: The ion exchange membrane system "16" is a substrate that includes a channel "17" with first and second channel walls "16a" & "16b" where the curable liquid electrolyte is disposed in the channel and the first electrode

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"19" is disposed in the first channel wall and the second electrode is disposed in the second channel wall. In addition, it is implicit from the teaching of Puffer et al that the substrate is porous because otherwise the ion exchange membrane would not function to transport ions from one electrode to the other electrode.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Okaniwa/Singleton fuel cell to include first and second spacers connected to the first and second electrodes wherein the curable liquid electrolyte is disposed between the first and second spacers and an injection port disposed between the first and second electrode forming a cavity wherein the curable liquid electrolyte is disposed in the cavity; a porous substrate; at least one channel disposed in the porous substrate having a first channel wall and a second channel wall wherein the first electrode is disposed in the first channel wall and the second electrode is disposed in the second channel wall, and the curable liquid electrolyte is disposed in the channel in order to simplify the manufacturing of the fuel cell by utilizing a structure that is capable of injecting a liquid electrolyte in between the two electrodes.

12. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Okaniwa et al (JP 2003-082012) in view of Singleton et al (US 5425865) and Puffer et al (US 3403054), and further in view of Fly et al (US 2002/0114990). However, Okaniwa et al as modified by Singleton et al and Puffer et al does not expressly teach a substrate that is a porous media. The Fly reference discloses a substrate that is a porous media (See paragraph [0017]). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Okaniwa/Singleton/Puffer fuel cell

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to include a substrate that is a porous media in order to ensure an essentially uniform distribution of gases through the channel in the porous media across the surface of the membrane electrode assembly.

13. Claims 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okaniwa et al (JP 2003-082012) in view of Singleton et al (US 5425865) and Puffer et al (US 3403054) as applied to claim 13 above, and further in view of Mayer et al (US 6332990). However, Okaniwa et al as modified by Singleton et al and Puffer et al does not expressly teach a substrate that comprises a carbon filled epoxy, a carbon filled polymer, a manganelli phase titanium oxide, a foam, a monolith of porous material, an aerogel, a mat, a felt, a paper, a mesh, or laminates thereof. The Milliken reference discloses a substrate that is a carbon aerogel mixed with polymers (See column 3, lines 56-60). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Okaniwa/Singleton/Puffer fuel cell to include a substrate that is a carbon aerogel mixed with polymers in order to simplify the manufacturing of the substrate by allowing the precursor materials to be spread in thin films.

14. Claims 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okaniwa et al (JP 2003-082012) in view of Singleton et al (US 5425865) and Puffer et al (US 3403054) as applied to claim 13 above, and further in view of Jones et al (US 5998054).

However, the Okaniwa et al as modified by Singleton et al and Puffer et al does not expressly teach a base comprising a distribution plenum for transporting curable

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liquid electrolyte, at least one fluid port in fluid communication with the channel, at least one master port for receiving curable liquid electrolyte into the base, and a cap disposed over the first electrode to seal the electrode.

The Jones reference discloses a base comprising a distribution plenum "134" for transporting curable liquid electrolyte, multiple fluid ports "131" in fluid communication with the channel, one master port "132" for receiving curable liquid electrolyte into the base, and a cap disposed over the first electrode to seal the electrode (See Figure 3).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Okaniwa/Singleton/Puffer fuel cell to include a base comprising a distribution plenum for transporting curable liquid electrolyte, multiple fluid ports in fluid communication with the channel, one master port for receiving curable liquid electrolyte into the base, and a cap disposed over the first electrode to seal the electrode in order to simultaneously inject the curable liquid electrolyte into multiple unit cells in the fuel cell stack.

Response to Arguments

15. Applicant's arguments, see Remarks, filed 8/28/06, with respect to the rejection(s) of claim(s) 1-18 under 35 USC 103 have been fully considered and are persuasive. Therefore, the rejections have been withdrawn. However, upon further consideration, a new ground(s) of rejection are made in view of Okaniwa et al and Singleton et al.


Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tony Chuo whose telephone number is (571) 272-0717. The examiner can normally be reached on M-F, 8:30AM to 5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's trainer, Susy Tsang-Foster can be reached on (571) 272-1293. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TC


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PRIMARY EXAMINER